MELT AND SOLUTION PROCESSING OF THE POLY(HYDROXY-AMIDE) FAMILY OF POLYMERS

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ABSTRACT: The poly(hydroxy-amide) [PHA] family has been studied as a fire-safe polymers for several years. Even though PHA has displayed excellent thermal properties, due to its limited processability, other members of the PHA family were investigated for ease of processing while maintaining their advantageous thermal properties.

For example, poly(methoxy-amide) [PMeOA] has been synthesized and characterized for thermal properties and processability. DSC and TMA of solution cast films have shown a phase transition occurring at 225ºC. Fibers have been spun from the molten state of PMeOA using a Micro-Compounder with twin mixing screws (DACA Co.). Fibers spun at 320ºC, with average diameters of 180 ?m, show an ultimate tensile strength, an elongation at break, and a Young's modulus of 60 MPa, 2.2%, and 3.6 GPa, respectively. Films were also made by spin-coating or solvent casting to observe the effect of cyclization on tensile properties. PMeOA can chemically convert to the highly thermally stable PBO via ring cyclization. These films had an ultimate tensile strength and Young's modulus of 120 MPa and 3 GPa, respectively. Preliminary studies have shown that, with heat treatment below the decomposition temperature, an improvement of the tensile modulus can be achieved. The effect of heat treatment on fiber tensile properties has also been investigated.